

CHANGES IN *GALACTIA* (FABACEAE) OF THE SOUTHEASTERN UNITED STATES

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ABSTRACT

Different names and realignments are presented for several species of *Galactia*. It is shown that *G. volubilis* (L.) Britt. and *G. macreei* M. A. Curtis sensu most recent authors should be called *G. regularis* (L.) BSP and *G. volubilis* (L.) Britt. respectively. *G. glabella* Michx. is supported as the replacement name for what has been treated by most authors as *G. regularis* (L.) BSP. *G. glabella* is shown to consist of three partly sympatric forms but studies are insufficient to decide what taxonomic status, if any, should be assigned to them. A diagnostic key for eight species and distribution maps for six species are presented. More detailed diagnoses than can be included in a key are presented for better understanding of *G. regularis*, *glabella*, *volubilis*, and *mollis*, specimens of which have been abundantly misidentified.

Galactia in the Southeastern United States has interested me for at least 30 years. Intermittently I have attempted to solve some of the many complex problems inherent in this genus, but only recently have sufficient data and conclusions been accumulated to justify their presentation. First I described one new species (Duncan, 1977). I am now presenting my remaining conclusions, fully aware that some may not hold up under future studies but also realizing the unlikelihood of my making further studies of this subject. Taxa confined to peninsular Florida are omitted due to insufficient study of materials from there. A key to all other species of the Southeastern United States as I interpret them follows.

KEY TO SPECIES

1. Leaves with 5-9 leaflets *G. elliotii*
1. Leaves with 3 leaflets 2
 2. Plants erect, inflorescences subsessile *G. erecta*
 2. Plants twining or trailing, inflorescences pedunculate 3
 3. Calyx lobes brown to reddish brown on inner surface when dry; corollas dark colored when dry, persisting after withering, sometimes partly present when fruit is mature *G. mollis*
 3. Calyx lobes greenish-yellow to tan on inner surface when dry; corollas light colored when dry, falling as they wither or soon thereafter 4
 4. Stems with fine close mostly spreading hairs, the longest 0.7 mm or longer *G. floridana*
 4. Stems with fine antrorse, retrorse, or spreading hairs under 0.7 mm long, rarely a few longer, but hairs not dense 5
 5. Hairs on stems antrorse 6
 6. Internodes only a little longer to usually shorter than the largest leaflet of adjacent nodes, hairs on stems 0.05-0.25 mm long *G. minor*

6. Several to most internodes (especially those toward the base) much longer than the largest leaflet of adjacent nodes, hairs on the stem 0.1–0.8 mm long *G. glabella*
5. Hairs on stems retrorse to spreading 7
7. Mature flowers 7–9 mm long *G. regularis*
7. Mature flowers 10–18 mm long 8
8. Longest inflorescences 3–15 cm long, nodes near the tip close and the flowers congested; ovules 6–9 *G. glabella*
8. Longest inflorescences 5–55 cm long, flowers in separated nodes and not congested near tip; ovules 10–13 *G. volubilis*

DISCUSSION OF SPECIES

G. ELLIOTTI Nutt. and *G. ERECTA* (Walt.) Vail

These species have distinct features and are rarely confused with others in contrast with all other species, which are frequently misnamed.

G. MOLLIS Nutt.

This taxon is often confused with *G. floridana*. In addition to the characters in the key the legume of *G. mollis* has dense divergent hairs prominently visible macroscopically while in the former species the hairs are scarcely or not visible macroscopically and are retrorse-appressed to retrorse-spreading to a few scattered hairs being divergent.

G. FLORIDANA T. & G.

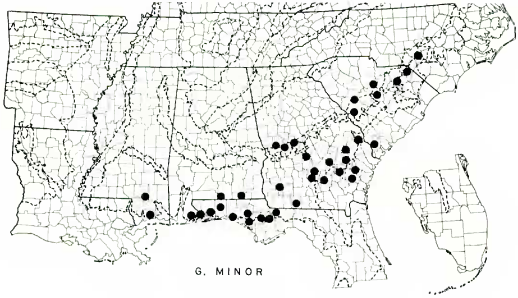
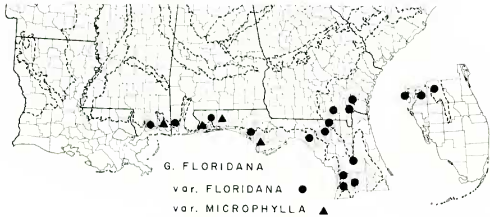
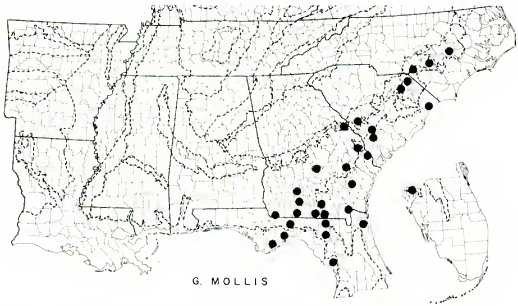
For the present this species is best treated as two varieties, *floridana* and *microphylla* Cham. The latter has shorter internodes, smaller leaflets, shorter petioles, and the inflorescences are shorter than the leaves. Inflorescences are mostly longer than the leaves in var. *floridana*. Additional studies are needed to test this separation more thoroughly. Growing plants under the same conditions is likely to be helpful.

G. MINOR Duncan

Additional aids to the identification of this taxon are: stems geniculate (uncommonly not), largest leaflets 14–28 mm long, inflorescences with 1–3(4) flowers, the longest inflorescence little if any longer to shorter than the subtending leaf, and flowers 11–17 mm long.

G. REGULARIS (L.) BSP.

For many years there seems to have been little disagreement among taxonomists concerning the application of the name *G. regularis*. Descriptions, although differing in some details, indicate that each author had the same taxon in mind. These authors include Small (1933), Fernald (1950), Gleason and Cronquist (1963), Wilbur (1963), and Radford et al. (1964). Under this name until now, as indicated by the descriptions, have been included individuals that were prostrate or rarely twining; had inflorescences shorter or longer than the leaves and with one to many flowers, nodes close in the upper part of most inflorescences, and flowers congested or few; flowers 10–18 mm long and with a calyx 6–10 mm long; and stem hairs 0.05–0.8 mm long and usually retrorse, but frequently antrorse and sometimes spreading [description mine].



Although at first glance the type specimen (Virginia — Clayton — ex. Herb. Gronovii in BM) in some respects looks like a specimen of *G. regularis* sensu recent authors, it differs significantly from the above description in several details. The calyx is only about 5 mm long, the flower only 8 mm long, the upper flower clusters are evenly spaced and not congested, and the hairs on the stem are soft and spreading which is very unusual for *G. regularis* as it has been interpreted. These data fit in all respects what has been treated variously as *G. volubilis* (L.) Britt. (Small, 1933, in part; Fernald, 1950; Wilbur, 1963; Gleason and Cronquist, 1963, in part; Radford et al., 1964), *G. volubilis* var. *mississippiensis* Vahl, and *G. mississippiensis* (Vahl) Rydb. Also the description by Linnaeus (Sp. Pl. II: 726. — no. 8, *DOLICHOS regularis*) can as easily be applied to this taxon as to what has been passing as *G. regularis*. Therefore, the name *G. regularis* should be used for *G. volubilis* sensu Fernald (1950) et al.

During the checking of hundreds of herbarium specimens, I noted that *G. regularis* and *G. mollis* often had been confused. The hairs on the stem do seem to intergrade in size and abundance, with *G. mollis* generally having the longer and more abundant hairs. A series of measurements of hairs on specimens of known identity probably will show that almost all specimens of these two species can be identified by hair characters. Until this is done, except for sterile specimens, there are other means of identification as follows:

Calyx greenish-yellow to tan on inner surface when dry; corolla light colored when dry, falling as it withers or soon afterwards; legume with scattered divergent to antrorse-appressed hairs scarcely or not visible macroscopically . . . *G. regularis*
 Calyx brown to reddish brown on inner surface when dry; corolla dark colored when dry, persisting after withering, sometimes partly present when fruit is mature; legume with dense divergent hairs prominently visible macroscopically . . . *G. mollis*

A partial synonymy of *G. regularis* should be useful in adjusting to the new application of this name and follows:

Galactia regularis (L.) BSP. Prel. Cat. N.Y. 14. 1888.

Dolichos regularis L. Sp. Pl. 726. 1753.

?*Hedysarum volubile* L. Sp. Pl. 750. 1753.

?*Ervum volubile* Walt. Flr. Car. 187. 1788.

Galactia mollis Nutt. Gen. 2: 117. 1818. Not Michx., 1803.

Galactia pilosa Ell. Bot. S.C. and Ga. 2: 238. 1824. Not Nuttall, 1818.

Galactia villosa Eaton & Wright. N. Am. Bot. 248. 1840. Not Wight and Arnott, Prodrum Fl. Ind. Orient I. 1834.

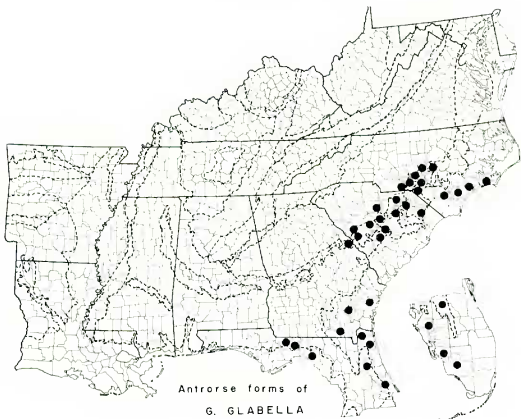
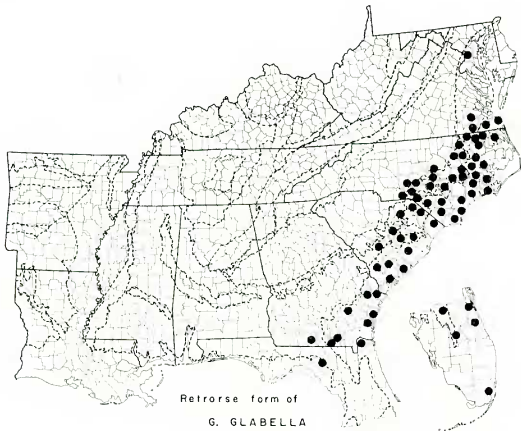
Galactia volubilis (L.) Britt. Mem. Torr. Club 5: 208. 1894. Sensu:—Small, 1933, in part; Gleason & Cronquist, 1963, in part; Fernald, 1950; Wilbur, 1963; Radford et al., 1964.

Galactia volubilis (L.) Britt. var. *mississippiensis* Vail. Bull. Torr. Bot. Club 22: 500. 1895.

Galactia mississippiensis Vail. Bull. Torr. Bot. Club 22: 500. 1895.

G. GLABELLA Michx.

In order best to understand the application of this name it is useful to



discuss the variability of the plants that have long been designated as *G. regularis*. Actually there are two and maybe four taxa involved. One is *G. minor* which has been discussed. The remaining plants of the former *G. regularis* consist of at least three types of plants. One has retrorse or very rarely retrorse-spreading hairs. The other two types have appressed antrorse or very rarely partly antrorse-spreading hairs. No plants have predominately divergent hairs. The three types have definite distributional patterns which coincide only partly. They have some characteristics in common which are different from those of *G. minor*, including having the stems straight, not geniculate; several to most internodes much longer than the longest leaflet of the adjacent nodes; the longest inflorescences longer than the subtending leaves, uncommonly shorter, and with several to many flowers, rarely as few as 4, the upper nodes close and the flowers congested in the larger inflorescences. It is interesting that Small (1933) reserved the name *G. regularis* for those individuals having "minutely retrorse-pubescent" stems. However, none of the other species he includes can be the antrorse-haired *G. minor*.

The "retrorse" population is much more abundant than the "antrorse" ones. Its characteristics essentially are those recognized in publications for those plants until now designated as *G. regularis*. The next oldest name that possibly could apply to this "retrorse" taxon is apparently *ERVUM? volubile* (Walter Flr. Car. 187. 1788). However, Linnaeus (Sp. Pl. II: 750. 1753) had used the epithet previously describing the plants as having "caule volubile," which is unusual for this taxon. Furthermore, I shall show later that *volubile* applies to another taxon.

I believe, however, that Michaux's *Galactia glabella* (Fl. Bor. Am. 2: 62. 1803) can be used for the "retrorse" taxon with reasonable confidence. Michaux's description of the plants as being (translation) "almost glabrous: leaflets oblong-oval, both ends shallowly notched, obtuse: calyx glabrous" is unlikely to apply to any other *Galactia*, and especially to those taxa known to occur where the type specimen was collected, namely *G. volubilis* and the "retrorse" plants. At flowering the calyx of *G. volubilis* is nearly always appressed hairy and only rarely nearly glabrous. On the other hand, the calyx of specimens of the "retrorse" plants is often glabrous or nearly so.

The type specimen of *G. glabella* (Michx. Herb.—Col. Co.—S. Carolina—in P) neither supports nor rejects application of the epithet to either of the above taxa. The specimen is apparently from Colleton County, which included at that time all of Charleston County southwest of the Ashley River. The specimen consists of three separate partly twining pieces, all sterile. None of its characters strongly favors either taxon other than the twining which is much more common in *G. volubilis*. However, rather than creating a new name because of this possible discrepancy, I favor using *G. glabella* on the basis of the strong implications involved in Michaux's describing the calyx as glabrous. His description most likely is based on a specimen from the "retrorse" population.

A detailed description of *G. glabella* (*G. regularis*, in the sense of previous authors, minus *G. minor* and the other "antrorse" populations) should be helpful and follows:

Perennial herb. Stems prostrate, straight or sometimes twining, bearing appressed to rarely spreading—retrorse hairs 0.02–0.45 mm, or rarely a few scattered hairs to 0.7 mm long; some internodes, if not all, longer than the longest leaflet of the subtending nodes. Leaves compound, 28–92 mm long; leaflets 3, elliptic to narrowly elliptic to narrowly ovate to ovate, usually retuse, entire, largest per plant 7–20 mm wide and 20–45 mm long, thinly antrorse-appressed hairy beneath, glabrous or sometimes antrorsely scabrous above. Inflorescences axillary, longest 2–15 cm long, longer than the leaves, rarely shorter. Longest pedicels at flowering 2–5 mm long. Flowers 5–13 per inflorescence, 12–18 mm long. Calyx 5.5–9 mm long, glabrous or with antrorse appressed hairs. Longest dehiscing anthers usually 0.88–1.20 mm long (1:17 is less than 0.88 mm long). Legume 35–52 mm long and 4.5–5.7 mm wide, bearing appressed antrorse hairs. Maximum number of ovules or seeds (including aborted ones) per specimen 6–9(10) per legume.

Representative specimens include: VIRGINIA: Southampton Co.: *Fernald and Long 8744* (DUKE); NORTH CAROLINA: Pender Co.: *Wilbur 4136* (FSU, GA); Scotland Co.: *Fox and Godfrey 2412* (DUKE). SOUTH CAROLINA: Orangeburg Co.: *Ables 31751* (NCU). GEORGIA: Chatham Co.: *Duncan 21128* (NCU), *Duncan 21229* (GA). FLORIDA: Brevard Co.: *Kral 5066* (FSU).

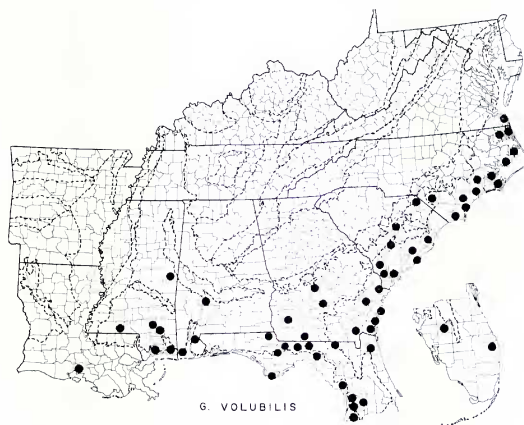
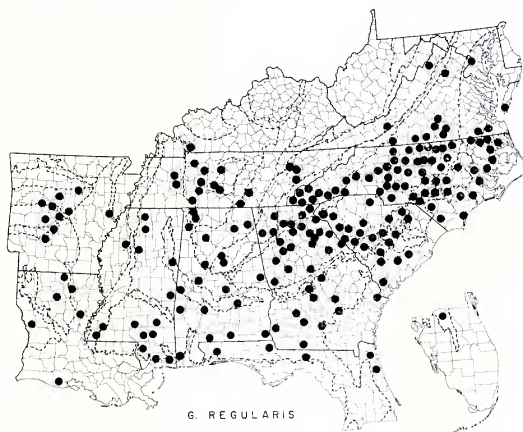
I have no strong feelings as to how the "antrorse" population should be treated, as a separate species, as a variety of *G. minor* or *G. glabella*, or otherwise. It seems useful to others to point out that the Florida material and that from the coastal and adjacent counties into North Carolina have leaflets averaging broader than those of the more inland populations of NC, SC, and GA. The narrow aspect of the leaflets of this latter group is quite evident in comparison, width-length ratios being mostly around 1:3(4) as compared to mostly 1:2. I have other commitments which will keep me from attacking these and other problems involved for at least several years and so am leaving them for others who I know are interested in the problem. Until further studies can be made, it seems best to include these as forms of *G. glabella*, providing them with no names.

Representative specimens of the antrorse forms include: NORTH CAROLINA: Bladen Co.: *Rogers and Blomquist 3120* (DUKE). Moore Co.: *Fox and Godfrey 2424* (GA). Richmond Co.: *Correll 1079* (DUKE). Scotland Co.: *Ables 28568* (NCU). SOUTH CAROLINA: Lee Co.: *Radford 27337* (NCU). Kershaw Co.: *Radford 23549* (NCU). Marion Co.: *Bell 13677* (NCU). GEORGIA: Clinch Co.: *Norris 1132* (USC). Charlton Co.: *Duncan 22068* (GA). McIntosh Co.: *Bozeman 2824* (NCU). FLORIDA: Lee Co.: *Moldenke 951* (DUKE). Nassau Co.: *Godfrey 64135a* (FSU), *Godfrey and Lindsey 56855* (FSU).

Useful synonymy for *G. glabella*:

Galactia glabella Michaux. Fl. Bor. Am. 2: 62. 1803.

Galactia parshii Desv. Am. Sci. Nat. 9: 413. 1826.



Galactia regularis (L.) Britt. Sensu Small, 1933. In part sensu: Fernald, 1950; Gleason & Cronquist, 1963; Wilbur, 1963; Radford et al., 1964.

G. VOLUBILIS (L.) Britt.

As indicated earlier, *G. regularis* has been treated by recent authors as *G. volubilis*. These decisions were apparently based largely on the description by Linnaeus and an illustration he cited (Dill. Elth. 173. t. 143. f. 170). The description could just as well cover *G. macreei* M. A. Curtis sensu Fernald (1950), Wilbur (1963), and Radford et al. (1964). It is also quite doubtful which of these species the illustration represents. The leaf shape and relatively long pedicels are probably of the latter. The retrorse-spreading hairs on the stem and the antrorse-spreading hairs on the calyx are likely of *G. regularis*. However, I have seen each of these characters on specimens¹ of *G. macreei* sensu above. Although the apex of the standard of the latter is rounded or nearly so and that of *G. regularis* is retuse, the illustrations (Dill. Elth., above) of the flower are inconclusive as characteristics of both taxa are displayed. On these bases application of the epithet *volubilis* is clearly in doubt. Fortunately help is provided by a specimen in the Dillenius Herbarium labeled "*Hedysarum trifoliatum scandens*." From 1:1 photocopies of the specimen and other data provided by F. White, Curator of the Herbaria at Oxford University, Great Britain, the following diagnostic characteristics were derived: Hairs on stems retrorse-appressed, longest inflorescence 29 cm long with well separated nodes, longest pedicels at flowering ca. 4 mm long, longest flower 13 mm long, longest calyx ca. 6 mm long, the corolla light colored when dry. The specimen is clearly of *G. macreei* sensu the authors indicated earlier. On the basis of priority, however, *G. volubilis* (L.) Britt. should be used for the taxon.

G. volubilis and *G. glabella* are similar in several ways and have been confused. Both twine, the former occasionally and the latter usually, but when the latter is growing in bare areas it cannot climb and is prostrate like the former. They may be separated as follows:

Longest inflorescences 3–15 cm long, upper flower clusters congested; longest flowers 12–18 mm long; longest dehiscing anthers usually 0.88–1.20 mm long (1:17 is less than 0.88 mm long); maximum number of ovules or seeds (including aborted ones) per specimen 6–9, rarely 10(1:26) per legume.	<i>G. glabella</i>
Longest inflorescences 5–55 cm long, all floriferous nodes well separated; longest flowers 10–14 mm long; longest dehiscing anthers 0.65–0.88 mm long; maximum number of ovules or seeds (including aborted ones) per specimen usually 10–13, rarely 9(1:43) per legume.	<i>G. volubilis</i>

Numerous plants of *G. volubilis* have also been identified as *G. regularis* sensu Duncan and also the reverse. This can be prevented by checking the following differences:

¹ Jasper Co., SC; H. E. Ahles 15677; NCU 103886 + 103876.—Long Co., Ga.; J. R. Bozeman 2114; GA 94661.

Hairs on the stems usually spreading, to occasionally retrorse-spreading to uncommonly retrorse appressed; leaflets mostly elliptic to ovate; longest inflorescences usually 3–15 cm long, longest pedicels at flowering 2.0–2.5 mm long; longest calyx 4.0–5.5 mm long; longest flowers 7–9 mm long; longest dehiscent anthers 0.38–0.63 mm long; hairs on legume spreading to uncommonly antrorse (rarely appressed); maximum number of ovules or seeds (including aborted ones) per specimen usually 5–7, occasionally 4 or 8, or rarely 3 or 9² (1:133) per legume. . . *G. regularis*

Hairs on the stems usually retrorse appressed to uncommonly retrorse-spreading; leaflets narrowly elliptic to narrowly ovate or approaching the above; longest inflorescences 5–45 cm long, longest pedicels at flowering 3.0–4.0 mm long; longest calyx (5.5) 6–10 mm long; longest flowers 10–14 mm long; longest dehiscent anthers 0.65–0.88 mm long; hairs on legume antrorse-appressed or rarely antrorse-spreading; maximum number of ovules or seeds (including aborted ones) per specimen usually 10–12, occasionally 13, or rarely 9³ (1:43) per legume. . . *G. volubilis*

Partial synonymy for *G. volubilis* follows:

Galactia volubilis (L.) Britt., Mem. Torr. Club 5: 208. 1894. Sensu: Small (1933) in part, Gleason & Cronquist (1963) in part.

?*Hedysarum volubile* L. Sp. Pl. 750. 1753.

?*Ervum volubile* Walt. Fl. Car. 187. 1788.

Galactia pilosa Nutt. var. *macreei* (Curtis) T. & G. Fl. N. Am. 1: 287. 1838.

Galactia pilosa Nutt. var. *angustifolia* T. & G. Fl. N. Am. 1: 287. 1838.

Galactia macreei M. A. Curtis, Bost. Jour. Nat. Hist. 1: 120. 1837. Sensu Fernald (1950), Wilbur (1963), Radford et al. (1964).

Galactia volubilis (L.) Britt. var. *intermedia* Vail, Bull. Torr. Bot. Club 22: 508. 1895.

DISTRIBUTION

During this study distribution maps were prepared for *Galactia minor*, the retrorse form of *glabella*, the antrorse forms of *glabella*, *regularis*, *volubilis*, *mollis*, and *floridana*. The specimens were mostly from DUKE, FSU, GA, NCU, VDB, and VSC. A few were from FLAS, GH, NY, and US. These distribution data were essential during my study, and are useful in understanding my interpretations of these taxa. They are presented here for the Southeastern United States.

Appreciation is expressed to my colleague, Dr. Samuel B. Jones, for suggestions involving the study; to Dr. G. Taylor, Keeper of Botany, of the British Museum, London, who many years ago provided details about the type specimen of *Galactia regularis*; and to F. White, Curator of the Herbaria at Oxford University, Great Britain. The loan from Duke University Library of the Ph.D. dissertation, "The genus *Galactia* in the United States," by Hollis J. Rogers and the loans of specimens through the courtesy of curators of the several herbaria are appreciated.

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² The only specimen with 9 seeds is from Yell Co., Ark.

³ The only specimen with 9 seeds is from Iberia Parrish, La.

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